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There he always found rest from his labors in an atmosphere of love not often of this world; and when, on December 27, 1883, his final summons came, suddenly as the soldier would have wished, his sons and daughter were able to gather round and support their mother in her affliction.

When, upon his own application in 1879, his name was placed on the retired list of the Army, it was universally felt that one of the great men of the age had entered upon a merited rest. During a long life he had always ranged himself on the side of right, justice, and truth; and no personal considerations had ever hampered him when he felt that duty required a strong and decided stand. With all this strength, he was one of the kindest and most generous of men, and he possessed a personal magnetism which never failed to win the regard of those thrown into close relations with him. Indeed, the closer those relations, the stronger were the feelings of admiration and love engendered.

WILLIAM AUGUSTUS NORTON.

WILLIAM AUGUSTUS NORTON was born in East Bloomfield, N. Y., October 25, 1810, and died, September 21, 1883, after an illness of but a few days, within a month of the completion of his seventy-third year.

In 1827 he entered the Military Academy at West Point, where he graduated with high honors, and, in 1831, was promoted Second Lieutenant of Fourth Artillery, and assigned to duty as Acting Assistant Professor of Natural Philosophy in the Military Academy. He filled this position until 1833, with the exception of a few months, when he served with his regiment in the "Black Hawk War." In 1833 he resigned his position in the army, and was appointed Professor of Natural Philosophy and Astronomy in the University of the City of New York. This position he filled until 1839. He was afterwards Professor of Mathematics and Natural Philosophy in Delaware College, Newark, Delaware. This post he held for ten years, when he was elected President of the College, and served in this capacity during the year 1850. He then went to Brown University, Providence, Rhode Island, where he had charge of the Department of Natural Philosophy and Civil Engineering. In 1852 he was elected Professor of Civil Engineering in Yale College; and in the autumn of that year he entered upon his duties with a class of twenty-six students, who had followed their instructor from Brown University.

From that time, to the day of his death, he was ever found at his

post of duty, and many of his old pupils now filling responsible positions throughout the country will testify to the practical value of his instruction, to his great capacity as a teacher, and to his character as a man.

By his death the Sheffield Scientific School thus loses its oldest and one of its most widely known and beloved instructors. A teacher of more than fifty years' experience, an earnest and careful investigator, the school has had almost from its very inception — over a period of more than thirty years — the benefit of his skill and zeal. With its growth and rapid development he is identified, and to his faithful and devoted labors its success and reputation are largely due.

A teacher's best testimonial is the esteem and respect of his pupils, his best reward their love and confidence, and in this respect Professor Norton stood very high. No teacher ever had more loyal pupils. It has been the privilege of the writer to be his pupil, afterwards his colleague, — always his friend, — and during that period of seventeen years he has never met or known any student to entertain or suffer any doubt of Professor Norton's entire impartiality, his skill and fidelity as a teacher, or his friendly interest. With a manner peculiarly genial and endearing in the class-room, frank and manly always and at times almost jovial, he imparted to every pupil something of his own enthusiasm, and made each one feel that his instructor was also a personal friend. No student ever acted upon this impression and found it to fail. Ever ready with suggestion, advice, encouragement, and aid, young at heart himself and believing thoroughly in the young men under his charge, he was more to them than the subjects he taught, and his personal influence was better than books. Many of his old pupils will learn of his death with keenest sorrow, and will feel his loss as that of a friend.

Professor Norton was not a man whose work began and ended in the class-room. His educational and scientific contributions were numerous and important. Among these the chief published works are a "Treatise on Astronomy, Spherical and Physical," 1839, and a "First Book of Natural Philosophy and Astronomy," 1858. Of these, the first is a very complete and thorough treatise, which has passed through several editions.

His scientific memoirs were contributed mostly to the American Journal of Science, or the Philosophical Magazine of London, or were read at meetings of the American Association for the Advancement of Science, or of the National Academy of Sciences. Of these, the following are some of the more important: —

Terrestrial Magnetism. *American Journal of Science*, Second Series, Vol. IV. Periodical Variations of the Declination and Directive Force of the Magnetic Needle. *American Journal of Science*, 1855.

Ericsson's Caloric Engine. *American Journal of Science*, 1853.

Donati's Comet, two memoirs. *American Journal of Science*, 1859 and 1861.

Molecular Physics, two memoirs. *American Journal of Science*, 1864 and 1872.

Principles of Molecular and Cosmical Physics. *American Journal of Science*, 1870.

The Corona seen in Total Elipses of the Sun. *American Journal of Science*, 1870.

Physical Constitution of the Sun. *American Journal of Science*, 1871.

Dynamical Theories of Heat. *American Journal of Science*, 1873.

Laws of the Deflection of Beams exposed to a Transverse Strain, tested by Experiment. *Proceedings of American Association*, 1870.

Physical Theory of the Principle of the Lever. *Proceedings of American Association*, 1870.

Results of Experiments on the Set of Bars of Wood, Iron, and Steel, after a Transverse Stress. Two papers read before the National Academy of Sciences (April, 1874, and April, 1875). A succinct statement of the general conclusions of the two papers published in the *American Journal of Science*, April, 1876.

Results of Experiments on Contact Resistance. Read before National Academy of Sciences, April, 1876; published in *American Journal of Science*, June, 1876.

The above list sufficiently indicates the scope and character of Professor Norton's scientific labors. Those of them which pertain to engineering subjects are valuable contributions to the science of which he was so long a teacher. His investigation of Ericsson's Caloric Engine was thorough and masterly. Made at a time when extravagant expectations were widely entertained with regard to the new motor, his conclusions, expressed in the paper of 1853, are referred to and quoted to-day as one of the best expositions of the true nature, character, and future of the hot-air engine.

His experiments upon the set and transverse strength and deflection of bars of wood, iron, and steel, constitute an important and valuable addition to engineering science. The experiments were conducted with care and skill, and the value of the results has since been repeatedly acknowledged, and the results themselves incorporated into standard text-books. These papers are clear, precise, and definite both in statement and description, — qualities characteristic of all of Professor Norton's work, whether in or out of the class-room.

Of his numerous contributions to the *American Journal of Science*, comprising some of the most earnest work of his life, that journal speaks as follows (November, 1883): —

"His earliest memoir was in the forty-sixth volume of the first series, and was on the mode of formation of tails of comets. The manner of action of a solar repulsion in producing the comet's tails was developed at length. Some of the ideas, though original with Professor Norton, had been anticipated by Olbers and Bessel. A series of papers followed upon the relations between the distribution of heat on the earth and the phenomena of terrestrial magnetism.

"From these he was led on to further discussion of magnetic action over the earth, and of like action, as he argued, in the body of the sun, and in the formation of the comas and tails of comets. These papers included especially an elaborate discussion of the famous comet of 1858.

"After this followed a series of papers on molecular physics, in which, starting from a few elementary assumptions, he arranged in one system the various phenomena of physics, explaining the gaseous, liquid, and solid forms of matter, the various phenomena of electricity and magnetism, of light, heat, attraction, crystallization, and chemical action; also explaining terrestrial, cometary, and solar physics, the whole worked out in detail. Many of his conceptions and arguments are in direct opposition to widely accepted theories. But if some, or even if all of them shall, in the end, fail to be accepted as truths of nature, yet these memoirs will continue to testify to his love of truth, his painstaking labor, and his complete grasp of the problems to be solved."

In addition to the special purely scientific work above mentioned, Professor Norton was, in 1859, appointed engineer on the part of the State of Connecticut to determine the boundary line in controversy between this State and that of New York.

Of late years Professor Norton's contributions have been few, owing to his almost complete absorption in the preparation of a work which should present in systematic shape the views and conclusions above alluded to. Upon this work, containing the ripest results of his life of study, he based his claim to scientific reputation. He spoke of it always with enthusiasm, regarding his views as having passed out of the region of mere theory and as being capable of conclusive demonstration, and he ardently hoped that he might live long enough to complete the work. This we believe he did, but his sudden death has prevented his superintending its publication. It is to be hoped that it will yet see the light, and constitute, as he always hoped it would, his best claim to scientific reputation.

Professor Norton needs, however, no such work as his best claim

to remembrance. That claim is best founded on his daily work as a beloved teacher and on his personal character as a true and high-minded man.

As a teacher the writer can speak from personal experience of his rare capacity, and any enthusiasm he might well be betrayed into while on this topic would be heartily indorsed by every one of his former pupils living to-day. And, as with the best teachers, the greatest advantages were unconsciously imbibed by his pupils from personal contact, — the unconscious influence of high ideals, of love of truth and honor, of personal integrity, of scrupulous exactness, — these were lessons daily enforced, and more valuable than any of those he so well knew how to extract from the text-book or illustrate on the blackboard. His patience and courtesy were unfailing. No student, however trying or dull, ever heard from him an impatient or sarcastic word. Throughout his long career as a teacher, he never had the ill will of a single pupil, or any of those collisions quite as often due to the lack of sympathy of the teacher as to the wilfulness of the scholar. With perfect gentleness and courtesy, a thoroughness which spared no pains, and a clearness of exposition which, in the writer's experience, is very rare, he took every student with him in the prescribed course, and sent him away at graduation not only a wiser but a better man, as well as a personal and enthusiastic friend.

Professor Norton was married, in 1839, to Miss Elizabeth Emery Stevens, of Exeter, N. H., with whom, for more than forty years, he enjoyed that household happiness and content for which his kind and gentle nature so eminently fitted him. To that little household of two every student of his was always welcome, and all know how good it was to be there. There he dropped the professor, and his students found always a hearty welcome, and a genial, sympathizing friend, — young at heart as themselves, and interested in all their plans and prospects.

The record of this long and useful life, the lofty aims and high character which lay back of it, the simple faith and sincere convictions which guided it, the manly, genial qualities of mind and heart which adorned it, combine to make it one which claims and holds a foremost place in that long list of honored names — faithful teachers, sincere investigators, and high-minded men — of which Yale College has a right to be and is most justly proud. The influence of such lives is the best heritage of universities, and their memories are a tower of strength to the institution which claims them, as well as an inspiration and example to the students and colleagues who cherish them.